**Topic:** To quantify the response of thermospheric density and composition to solar and high latitude forcing.

**Project Title:**
Effects of Hi- and Mid-Latitude Electric Fields on Thermospheric Composition and Winds

**PI Name:** Phillip Anderson
**PI Email:** Brian.Anderson@jhuapl.edu
**Affiliation:** University of Texas at Dallas
**Project Information:**
Ionospheric electric fields can have profound effects on the thermospheric composition and winds, particularly during geomagnetic activity. They influence numerous processes in the ionosphere/thermosphere (IT) system including plasma transport in the ionosphere, the ion drag force which affects neutral winds, and the Joule heating which drives much of the composition and structure of the IT system. They can extend to very low latitudes and can contribute substantially to the magnetospheric electric field structure, particularly during geomagnetic storms Modelers have begun to understand the importance of the subauroral electric field coupling to the thermosphere, the inner magnetosphere and the plasmasphere and efforts to incorporate recent results are currently underway. We propose to examine the effect of the subauroral electric fields on IT coupling by first developing an empirical model of the subauroral electric fields from data acquired by the low-Earth orbiting (LEO) Defense Meteorological Satellite Program (DMSP), Dynamics Explorer 2 (DE-2), and Atmosphere Explorer C (AE-C) spacecraft. The results will be incorporated into the Thermosphere Ionosphere Mesosphere Electrodynamics General Circulation Model (TIME-GCM) to examine the global effects of the subauroral electric fields on the thermospheric structure. The model outputs will be compared with model runs performed without the subauroral electric fields and with thermospheric composition data from the ultraviolet imagers on the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) and DMSP F16 spacecraft. We will also use event data from the AE-C and DE-2 spacecraft in conjunction with high resolution 2-D and 3-D nonhydrostatic models of the thermosphere to examine the small scale effects on the thermosphere of the subauroral electric fields. The DE "2 and AE-C satellites were the last satellites to carry instruments simultaneously measuring the in-situ thermospheric winds and composition as well as the 3-D ion drifts and ion composition. The data were largely ignored in the mid- and low-latitude regions and represent largely untapped databases from which to study thermosphere/ionosphere coupling in a region unfettered by direct auroral precipitation effects.

**ROSES ID:** NRA-NNH04ZSS001N
**Duration:**
**Selection Year:** 2005
**Program Element:** Focused Science Topic

---

**Citations:**